

Challenges for Today's Internet

George Sadowsky

Global Internet Policy Initiative

September 25, 2002

CARNET Users' Conference: CUC 2002

Zagreb, Croatia

Presentation Outline

- Historical perspective
- The Internet of 1992 and 2002
- Major Internet specific problems of 2002
- An academic and research perspective
- A development perspective
- A civil society perspective
- Conclusions and advice
- (Not necessarily a balanced presentation)

Historical perspective (1 of 2)

- Internet is now 40++ years old
- Started as research project, quickly became useful tool of A+R communities
 - A role that A+R communities need to continue to play
- Performance-to-price ratio has increased ~30% per year over 50 years
 - Forecasts of ultimate demise of Moore's law are greatly exaggerated

Historical Perspective (2 of 2)

- Alternating roles of content (facts, results, computation) and communication
 - Access to info. through computation: RLOGIN
 - Rapid emergence of e-mail: communication
 - NSFNET: access to computation (content creation)
 - Further spurt in growth in e-mail (communication)
 - WWW: access to content
- Never has a technology sprung so suddenly, so precipitously, on the public scene.

The Internet of 1992 (1 of 3)

- About 2 million users
- Culture evolving from prior state of loose, cooperative self-help community
- Network technologies;
 - Multiple competing models of organization
 - SNA for mainframe system: a star topology)
 - DECNet strong, especially among physicists
 - Token ring, ARCNet, Appletalk, StarLan (ATT), Lantastic, etc.

The Internet of 1992 (2 of 3)

- Tool set included e-mail, ftp telnet (POP protocols not yet deployed)
- Gopher just born at MIT (and soon to die)
- Internet seen **ONLY** as precursor to ‘Global Information Highway’
- Wasteful use of IP address space, some initial concern about running out of addresses

The Internet of 1992 (3 of 3)

- No hyperlink technology actively exploited
- Dominant medium of communication is ASCII
 - No commonly accepted (standard) international codes for a number of alphabets (Arabic, Cyrillic)
 - UNICODE Consortium recently formed
 - However, character set standardization still not complete
- None of the “developing world” connected

Things still in the future (1 of 2)

- Demise of ISO-OSI network model
- The attempt of ATM to displace TCP/IP
- But, introduction of valuable ATM concepts
 - Differential qualities of service
 - PVCs: permanent virtual circuits
 - SVCs: switched virtual circuits
 - On other hand:: 48-bit cell, 5 bit “cell tax”
 - IBM’s end-to-end ATM connectivity attempt

Things still in the future (2 of 2)

- Commercialization of the Internet
- The web, HTML, common multiple data types: images, audio, video, animation
- Push technology
- Emergence of voice over IP (VoIP)
- The .com frenzy: massive market test of Internet based ideas
 - with massive unethical corporate behavior

The Internet of 2002 (1 of 2)

- TCP/IP (v.4) protocol standards firmly established
- Well over 100 million nodes
 - The Internet IS the global information superhighway!
- Internet almost totally commercialized
- All countries (that want to be) are connected
- ISP communities are generally doing well

The Internet of 2002 (2 of 2)

- Culture of the Internet reflects real world rather than close cooperative group
 - Competitive, not necessarily sharing, all kinds of groups using the medium
- ASCII text still used a lot for email, but rich mix of data types exists and is commonly in use

Major Internet-specific problems of 2002

- Administration of the Internet
- The Intellectual property issue
- Market for information products - good and bad news
- Behavioral problems on the Internet
- These are by no means the only problems that the Internet faces

Administration of the Internet (1 of 4)

- Initially by IANA - Univ. of So. California
- Administration of IP numbers, protocol numbers, names
- TLDs .com, .org, .edu to Network Solutions (Verisign) to administer - a major mistake
- Debates re internationalization of Internet administration started in 1996
- Dep't of Commerce's green and white papers

Administration of the Internet (2 of 4)

- ICANN formed in 1998, three Soss (ASO, PSO, DNSO), expanded to include UDRP
- Operates under MoU with U.S. Department of Commerce, MoU up for renegotiation
- Demonopolization of registrars and registries
- Challenge: ICANN's control of the unique root
 - Alternative root challenges
 - Fracturing the Internet

Administration of the Internet (3 of 4)

- What's in a name?
 - Names have recognition value; trademark status
 - How and how fast to expand name space
 - Balance between role of private enterprise vs. “orderly” attempts at taxonomy, e.g. .aero
 - (Name collisions - an IP issue - arbitration, etc.)
 - UDRP (Uniform Dispute Resolution Protocol established to resolve such disputes

Administration of the Internet (4 of 4)

- Recent issues
 - Challenge of critics to destroy/reform ICANN
 - Dep't of Commerce of US Government to renew ICANN mandate?
 - ICANN proposals for reform : the Lynn proposal
 - ITU's challenge to administration of the Internet
- Part of problem is transition from small town, consensual space to being globally important
- Not at all clear where this is going

Intellectual property (1 of 3)

- Digital convergence is occurring
 - Media types: sound (CDs), video, data
 - Industries: Entertainment, education, information storage and retrieval
- Digital media can be copied exactly, as many times as wanted
 - Steganographic techniques to watermark with receipt
 - Transformations can destroy the watermark
 - If they're allowed (!)

Intellectual property (2 of 3)

- Peer-to-peer technology: :
 - massive copying of files (Napster, Gnutella)
- Producers, owners of copyrighted materials reluctant to provide if they can be copied
 - Recording studios, digital film producers
 - Owners of copyrighted archives, any media type
- Intellectual property holders have rights
 - But consumers have reasonable expectations of what their degrees of freedom are in such use

Intellectual property (3 of 3)

- Hardware responses: Intel, Verisign, Microsoft
 - “Digital Rights Management” (DRM) Technology
 - Intel:embed digital certificates in hardware
 - Some operability issues already: ex. DVDs
 - Major disruption possible regarding use of software, data, video, etc.
 - Similar to software copy protection devices in 1980s
 - Non-interoperability a major issue
- How will this be resolved in an acceptable way?

Markets for information products

- good and bad news (1 of 2)

- In theory, Internet facilitates a rich market for sale of information products on the net
 - Goal:sell pieces of information at very low cost
- Practically, depends on μ -payment technology
 - Must be small relative to transaction
 - Triangular model (Marvin Sirbu,Carnegie-Mellon)
 - Only commercial implementation has failed (CyberCash's "digital wallet")

Markets for information products

- good and bad news (2 of 2)

- On other hand, markets for information services are more promising
 - E-line, reverse auction markets
 - Implications for developing countries
- Bottom line: on-line market for intellectual products not developing as fast as hoped in any promising manner

Behavioral problems (1 of 3)

- Result of radical cultural shift among network users
- Spam - unwanted “junk” e-mail
 - Example: free “hot spots,” drive-by wi-fi spam attacks
- Viruses and other creatures, non-destructive and destructive
- Denial of service attacks
- Can aggregate: threats to national security

Behavioral problems (2 of 3)

- Truthfulness in information
 - Necessity to verify information regardless of the media that delivers it
 - Example: KZ government filtering and mimicking of opposition site
 - Example: CN tampering with search engine requests (Google, Yahoo, etc.)

Behavioral problems (3 of 3)

- Plagiarism: need to detect inappropriate exploitation of the works of others
 - Is this just a US phenomenon?
 - Can buy/find existing text to satisfy course req'ts
 - Various ways of detecting and stopping it
 - Plagiarism servers, term paper repositories
- Need cultural changes and legal agreements
- If this expands, we may be living in a cyberspace we don't want

An academic and research perspective (1 of 3)

- Academic and research community has led the way in network technology
- Early Internet culture a reflection of R+A culture; latter still exists, important to keep alive at some level
 - In research and education (A+R) sector

An A+R perspective (2 of 3)

- 1995-96 reaction to commercialization and loss of control of Internet-1 was Internet-2
 - Experimental applications on stable advanced base
 - Quality of service considered a prime objective
 - Limit to qualified research projects not enforced
 - High bandwidth obtained for all A+R activities
 - Successes in tele-medicine, arts performance
 - No general applications in video conferencing, general white board applications

An A+R perspective (3 of 3)

- Has Internet-2 paid off in terms of experimental applications incubation and maturation?
 - Too early to tell? (1996-2002) Probably not.
- Internet-2 has not paid off in terms of providing quality of service work differentiation
- Has Internet-2 paid off?
 - Has kept academics active in networking field Has resulted in very large increases in bandwidth (and has driven the commercial market in this direction
 - Has encouraged exploration in other areas, e.g. PKI

Academic and research leadership areas (1 of 3)

- Technical areas
 - Address space - deployment of Ipv6 and why
 - Use I2 to benefit Croatian researchers
 - Public key infrastructure, however, in experimental phase
 - Concepts: certification authorities, public/private key pairs, authentication
 - Very important for future Internet transactions

A+R leadership areas (2 of 3)

- Content and applications areas
 - Take back the published content space - Elsevier, theses, etc.
 - Lessig's information commons
 - Lead by applying network technology to practical applications, science, engineering government, etc.
 - Exploit foreign content for education, commerce
 - Encourage local content creation for education and universality

A+R leadership areas (3 of 3)

- Internet for learning
 - History of CAI (computer assisted instruction)
 - New model of NAL (network assisted learning)
 - Rapid adoption by classroom courses
 - History of distance learning is mixed
 - Failures: Western Governors, California State, NYU
 - Insensitivity to bandwidth issues
 - Lack of understanding of pedagogical issues
 - Wide range of educational models
 - NAL works best as adjunct to classroom education
 - NAL works well for well defined training models

A development perspective (1 of 3)

- Infrastructure: all countries connected (almost)
 - Declining costs, lots of work by many
 - Resistance from PTTs, governments
- Critical mass of human resources beginning
 - Role of Internet Society workshops
 - Regional training: Major contribution by CEENet
 - Substantial contribution of Cisco Academies, etc.
 - Regional and national training efforts, becoming too numerous to identify

A development perspective (2 of 3)

- Vast amount of educational material becoming available on the net
 - Organized courses, ex. MIT's plan
 - Unorganized material, but searchable
 - Realization of DEVSIS model
 - More formal models, e.g World Bank Gateway
 - To exploit it, need affordable access, language skills, searching methodology

A development perspective (3 of 3)

- Policy issues have become a critical bottleneck to faster deployment of the Internet
 - Role of GIPI: Global Internet Policy Institute (now active in 17 countries)
 - Goal is affordable accessible Internet
 - Issues are telecomm reform, licensing of ISPs, content control, consumer protection, etc.
 - Grass roots process, leading to governmental education, involvement, reform
- Policy matters!

A civil society perspective (1 of 2)

- Besides education, important sectors are health, commerce, government
- Government has **VERY** much to gain
 - Opportunity for transparency is enormous!
 - Make public documents, laws available
 - Allow citizen interaction with legislators (UK)
 - Allow transactions to be done remotely - (SRL)
 - Make procurements transparent (an anti-corruption issue)

A civil society perspective (2 of 2)

- Commerce - much is going electronic
 - Much of what enables e-commerce is not related to ICT (credit card economy, consumer protection and limited liability, effective law enforcement, environment of trust)
 - Nevertheless, national and international e-commerce will spread, and CAs and digital signatures may be important
 - Need legal basis: e-documents, e-signatures, etc.
- Health - many applications

Conclusions and advice (1 of 4)

- In 1992, the Internet was expanding rapidly, new ideas were starting to be tested
 - The Internet had not yet collided with the requirements of real life
 - It was still very much an experimental thing
- In 2002, the Internet is integrating into real life, with all of its messy behavioral issues
 - Now an essential piece of infrastructure
 - Its importance is rapidly increasing

Conclusions and advice (2 of 4)

- Key issues in every area are really unsolved
 - Administration of the Internet
 - The Intellectual property issue
 - Market for information products
 - Behavioral problems on the Internet
- In these circumstances, some advice
 - Croatia should exploit the net both for R+E and for the benefit of every sector of civil society
 - Academicians in Croatia should contribute to the solutions of the current problems.

Conclusions and advice (3 of 4)

- Ensure that:
 - The policy and regulatory structure of your country is beneficial to the Internet's expansion, competitiveness, and affordable availability
 - You exploit the Internet for all it's worth
 - You safeguard the liberty that the Internet provides, through some key structures and institutions in your own country

Conclusions and advice (4 of 4)

- Provide intelligent and focused assistance to other sectors of civil society concerned with the impact of ICT on their lives.
- Above all, nurture the spirit of the 1992 Internet, the original Internet, in your academic and research sectors; that's the driving force for all of these other changes and achievements that are so desirable for progressive national development.

Thank you very much!

George Sadowsky

George.Sadowsky@attglobal.net

Global Internet Policy Initiative

<http://www.internetpolicy.net/>